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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Jae-Young Jung
Serial No. : 09/713,775
Filed : November 15, 2000
Title : MARTENSITIC STAINLESS STEEL HAVING HIGH MECHANICAL STRENGTH AND CORROSION

Art Unit : 1742
Examiner : Deborah Yee

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BOX AF

Commissioner for Patents
Washington, D.C. 20231

RESPONSE TO FINAL OFFICE ACTION DATED APRIL 24, 2002

This document is filed in response to the final office action dated April 24, 2002 ("Office Action").

Claims 1-8 are currently pending. Among the rejected claims, claims 1, 3, 5, and 7 are independent. Claims 1 and 3 are drawn to martensitic stainless steel compositions, and claims 5 and 7 are drawn to methods of manufacturing the claimed martensitic stainless steels. Each of them, as amended, recites a composition including, among others, less than 0.06 wt.% C and 0.11-0.25 wt.% N.

Applicant would like to bring to the Examiner's attention a statement in the Specification:

> "In the present invention, the content of the C is decreased when compared with the conventional martensitic stainless steel, and the N content is additionally added to reduce the L-ferrite and to stabilize austenite. In addition, the N delays the transition of the steel to a large carbide such as $M_{23}C_6$ so as to prevent the deterioration of the corrosion resistance caused by the exhausting of the Cr. To

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achieve this effect, the N should be added to more than 0.04 wt.%" (page 7, lines 17-23).

Thus, the patentability of the claimed invention resides, at least in part, in a martensitic stainless steel containing a C content (<0.06 wt.%) and an N content (0.11-0.25 wt.%) much higher than the C content, thereby resulting in delay in formation of a carbide, e.g., $Cr_{23}C_6$, and improved corrosion resistance.

All of the pending claims are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hara et al. (JP 8-246107), or Bjorkroth (U.S. Patent No. 3,700,851), or JP 2-101143 ("JP '143"), or FR 2,566,429 ("FR '429") on various grounds.

Applicant respectfully discusses each of the prior art references and traverses each of the ground for rejecting independent claims 1, 3, 5, and 7 as follows:

Hara et al.

The Examiner asserts that Hara *et al.*

> "discloses a N range of 0.005 to 0.1%N which is slightly lower than applicant's N range of 0.11 to 0.25%N. Since applicant has not demonstrated criticality, then it would seem that a composition with 0.11% N vs. a composition with slightly less N (say 0.1%) would depict a mere difference in the proportion of element without any attendant unexpected results and hence would not patentably distinguish over the prior art" (the Office Action, page 3, lines 4-9).

Hara et al. teaches a steel containing more than 4.5 wt.% Ni, 1-3 wt.% Cu, 2-3 wt.% Mo, and 0.1-3 wt.% W has improved corrosion resistance (page 2, paragraph 008). In other words, according to Hara et al., it is the Ni, Cu, Mo, and W contents, not the relative N and C contents, that contribute to corrosion resistance improvement. In view of the Hara et al.'s teaching, a skilled person in the art, in order to improve corrosion resistance of a steel, would not have increased the N content from 0.005-0.1 wt.%, as disclosed in Hara et al., to 0.11-0.25 wt.%, as recited in claims 1, 3, 5, and 7.

Applicant would like to further point out that, contrary to the Examiner's assertion, unexpected results have been shown in the Specification. More specifically, two compositions containing 0.08 wt.% N and 0.11 wt.% N were tested in Examples 3 and 6, respectively. The

hardness values for the compositions described in Examples 3 and 6 were 392 Hv, and 429 Hv, respectively; and the yield strength values for those two compositions were 98.8 Kg/mm^2 and 110.2 Kg/mm^2, respectively. An artisan would not have expected that, the C content being the same (i.e., 0.02 wt.%), increasing the N content from 0.08 wt.% to 0.11 wt.% would increase hardness by 10% (i.e., from 392 Hv to 429 Hv) and increase yield strength by 12% (i.e., from 98.8 Kg/mm^2 to 110.2 Kg/mm^2).

For the reasons set forth above, it is submitted that claims 1, 3, 5, and 7 are non-obvious over Hara et al.

Bjorkroth

According to the Examiner,

> "Bjorkroth discloses on line 40 of claim 1, column 4, a N range of 0.02 to 0.12% N which would overlap with applicant's N range of 0.11-0.25% N ... There is nothing to show that the newly claimed N range of 0.11 to 0.25% is critical or that it involves more than judicious selection; and hence would not define patentable novelty over the prior art" (the Office Action, page 3, lines 2-13).

Applicant submit that the Examiner has failed to discern a distinctive difference between the composition of this invention and that disclosed in Bjorkroth.

Bjorkroth teaches a composition consists of 5-50% martensite and 50-95% ferrite plus austenite (see column 2, lines 37-40); "martensite" and "ferrite plus austenite" being two different steel crystalline structures. In contrast, the composition recited in claims 1, 3, 5, and 7 consists solely of martensite (see the preambles of each claim and the Specification, page 6, lines 11-13). Given this structural (i.e., primary) difference, the claimed invention is clearly patentable over Bjorkroth. Indeed, any overlap of the N contents is irrelevant or secondary to the determination of patentability. Kg/mm^2

Applicant submits that any *prima facie* case of obviousness can be rebutted by unexpectedly much higher yield strength of the steel of this invention, as compared with that of the compositions disclosed in Bjorkoth. Seven steel compositions of this invention containing 0.02-0.03 wt.% C and 0.08-0.21 wt.% N (see Examples 1-7, page 9 of the Specification) exhibited yield strength ranging from 80.5-120.8 Kg/mm^2 (see Examples 1-7, page 10 of the

Specification). Referring to Bjorkroth, it describes five compositions having C contents also in the 0.02-0.03 wt.% range (more precisely, 0.024-0.029 wt.%) but having much lower N contents, i.e., 0.060-0.101 wt.% (see Table I, column 3). All these five compositions exhibited yield strength ranging from 57-61 Kg/mm^2 (see Table II, column 4), much lower than 80.5-120.8 Kg/mm^2 for the just-described seven comparable compositions of this invention.

For the reasons set forth above, it is submitted that claims 1, 3, 5, and 7 are non-obvious over Bjorkroth.

JP '143 and FR '429

The Examiner asserts that "[t]he English abstract of JP '143 and FR '429, each discloses a martensitic stainless steel alloy with constituents whose wt% ranges overlap those recited by the claims; such overlap renders applicant's composition *prima facie* obvious despite differences in non-overlapping areas" (the Office Action, page 2, lines 16-19). Applicant disagrees.

As discussed above, the patentability of the claimed invention resides, at least in part, in a steel containing both N and C with the former in an amount (0.11-0.25 wt.% N) much higher than the latter (less than 0. 06 wt.% C). Such N and C contents results in improved corrosion resistance. Both JP '143 and FR '429 disclose compositions containing about the same amounts of N and C, i.e., 0.01-0.3 wt.% N and 0.05-0.3 wt.% C in JP '143; and 0.01-0.2 wt.% N and 0.05-0.25 wt.% C in FR '429. As JP '143 and FR '429 both do not teach or suggest decreasing the C content and increasing the N content to arrive at a composition of this invention, neither reference renders claims 1, 3, 5, and 7 obvious.[1]

Conclusion

For the reasons set forth above, it is submitted that claims 1, 3, 5, and 7 are non-obvious over Hara et al., Bjorkroth, JP '143, or FR '429. So are claims 2, 4, 6, and 8, which depend from claims 1, 3, 5, and 7, respectively.

[1] Since the patentability of claims 5 and 7 does not reside in the recited temperatures, it is not necessary to address the Examiner comments on austenitzing and tempering temperatures (page 2, penultimate paragraph of the Office Action).

Applicant further submits that all of the claims are now in condition for allowance, which action is requested.

Please apply any other charges to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 7-24-02

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